

Triple Mental Foramina Detected by CBCT

Hristina Mihaylova

Associate Professor, Faculty of Dental medicine, Department of Imaging and Oral diagnostic, Medical University – Sofia, Bulgaria

Abstract: *The identification of the mental foramen (MF) is an important prerequisite for surgical procedures involving anterior part of the mandible. Its position and possible presence of accessory mental foramina need to be considered before surgery in order to avoid mental nerve branches injury. We present a rare case of 33 - year - old woman with triple mental foramina of the right side of the mandible detected by CBCT which was not seen on panoramic radiography.*

Keywords: Cone-Beam Computed Tomography, Dental Implants, Mental foramen, Panoramic radiography

1. Introduction

The mental foramen (MF) is located on outer surface of the mandible, near the apices of the premolars. It permits passage of the mental nerve and blood vessels. The number of MF's can vary up to four on one side [1]. Accessory foramina occur due to splitting of the mental nerve into several fasciculi before the development of MF during the 12th week of intrauterine life [1].

Damaging of the neurovascular bundle in accessory MF can lead to sensory disturbances and hemorrhages during implant installations [1, 2]. Preliminary assessment about accessory mental foramina would prevent inferior alveolar nerve branches injury during periapical surgery and implant placement. Using intraoral and panoramic radiography the accessory mental foramina can be rarely observed [3]. MF and it's relation to neighboring anatomical structures of the lower jaw poorly visualized on panoramic radiographs can lead to in-correct plan of treatment in the mental region [1].

There is presence of other crucial structures related to the MF - mandibular incisive canal (MIC), lingual concavity and anterior loop (AL) of the inferior alveolar nerve which are also not clearly visible on radiographs [4-7]. They also should be considered before surgery (e.g. implant placement).

Introducing cone beam computed tomography (CBCT) in the dental practice ensures visualization of small bone structures and MF with high spatial resolution and relatively lower dose compared to multi detector computed tomography (MDCT).

2. Case Report

We present a case of 33 Caucasian women examined by CBCT (ILUMA™, Imtec Imaging, Ardmore, OK) as a part of implant planning. The scan was performed using a standard exposure and patient positioning protocol (120 KV, 40 s, 3.8 mA). The data were reconstructed at a voxel size of 0.3 mm. On the three-dimensional image and cross-sections derived from CBCT data triple mental foramina on the buccal surface of right side of the mandible were clearly seen (Fig1).

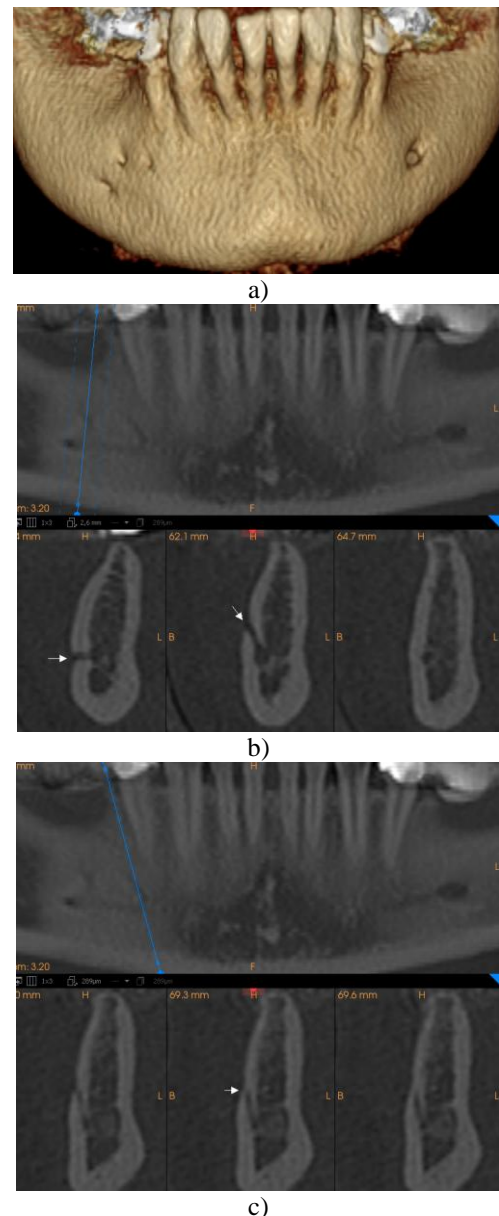


Figure 1: a) Three-dimensional reconstruction. Ovoid openings in the buccal cortex of the right mandible constituting a well-defined three MFs are visible. b) Panoramic reconstruction and crosssections with slice interval 2.6 mm through the distal right mental foramina. c) The same panoramic reconstruction and crosssections with slice interval 0.3mm through the medial right MF.

They were opened backward and were smaller than the opposite single MF sized 3 mm in diameter. The medial right sided MF was 1mm in diameter. The other two, distally placed (upper and lower) were 1.3 mm and 1.1 mm respectively. The connections of the three MFs with the right mandibular canal and the right mandibular incisive canal

were well visible on the cross section images (Fig 1 b, c). On the previously performed panoramic radiography the right MF was not clearly visible, so the patient didn't know about such anatomic variation (Fig2).

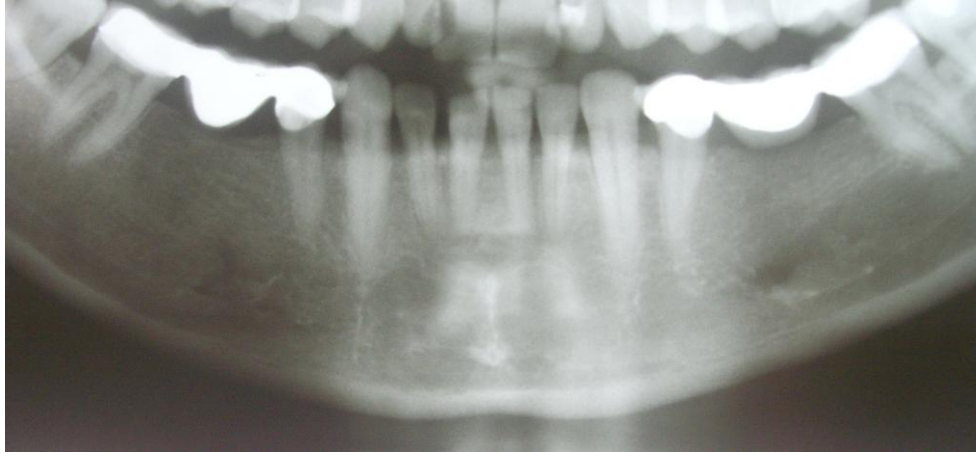


Figure 2: Cropped panoramic radiography showing left MF but not the right.

3. Discussion

The MF is an important landmark for surgery in the area of the chin. It is very important to preserve neurovascular bundle in the mandibular canal and MF when surgery (e.g. endosseous dental implantation) near the MF is planned. The position and number of MFs can vary among individuals, but panoramic and intra-oral radiographs not always demonstrate them [8, 9]. Triple mental foramina are rare finding. Gershenson et al. described triple foramina in 0.7 % of 525 dry mandibles, Katakami et al. reported 0.6% rate in 150 CBCT scans [10, 11]. The Multi-detector Computed Tomography (MDCT) is useful imaging modality to visualize MF [2]. Cone beam computed tomography (CBCT) is another exquisite technique in demonstrating bone structures in details. The advantage of this modality compared to MDCT is in the lower radiation dose and low cost [12]. Dose is dependent on equipment type and exposure parameters, especially the field of view selected [13]. The radiation doses (and hence risks) from dental CBCT are generally higher than conventional dental radiography (intraoral and panoramic) but lower than MDCT scans of the dental area [13, 18]. Using CBCT the mental foramina (i.e. accessory foramina) and other important anatomical structures as mandibular lingual and incisive canals, lingual concavity, and anterior loop of the inferior alveolar nerve could be clearly identified [4-7, 14-20].

In case of failure of radiographs to demonstrate the MF position and possible accessory mental foramina, CBCT is a method of choice before surgery in this area. This information can contribute to avoid potential neurosensory disturbances.

References

[1] Hasan T. Mental foramen morphology: a must know in clinical dentistry. *J Pak Dent Assoc.*2012;21(03):168-173.

[2] Haktanir A, Ilgaz K, Turhan-Haktanir N. Evaluation of mental foramina in adult living crania with MDCT. *Surg Radiol Anat.* 2010;32:351-356. doi: 10.1007/s00276-009-0572-1.

[3] Toh H, Kodama J, Ohmori T. Anatomical study of the accessory mental foramen and the distribution of its nerve. *Okajimas Folia Anat.*1992;69:85-8. DOI: 10.2535/ofaj1936.69.2-3_85

[4] Apostolakis D, Brown JE. The anterior loop of the inferior alveolar nerve: prevalence, measurement of its length and a recommendation for interforaminal implant installation based on cone beam CT imaging. *Clin Oral Implants Res.* 2012;23(9):1022-30. doi: 10.1111/j.1600-0501.2011.02261.x. Epub 2011 Aug 3.

[5] Apostolakis D, Brown JE. The dimensions of the mandibular incisive canal and its spatial relationship to various anatomical landmarks of the mandible: a study using cone beam computed tomography. *Int J Oral Maxillofac Implants.*2013;28(1):117-24. doi:10.11607/jomi.2372.

[6] Chan HL, Brooks SL, Fu JH, Yeh CY, Rudek I, Wang HL. Cross-sectional analysis of the mandibular lingual concavity using cone beam computed tomography. *Clin Oral Implants Res.* 2011;22(2):201-6. doi: 10.1111/j.1600-0501.2010.02018.x

[7] Yovchev D, Deliverska E, Indjova J, Zhelyazkova M. Mandibular incisive canal: a cone beam computed tomography study. *Biotechnology & Biotechnological Equipment.* 2013; 27(3): 3848-3851. DOI: 10.5504/BBEQ.2013.0020

[8] Jacobs R, Mraiwa N, Van Steenberghe D, Sanderink G, Quirynen M. Appearance of the mandibular incisive canal on panoramic radiographs. *Surg Radiol Anat.* 2004; 26:329-333. DOI: 10.1007/s00276-004-0242-2

[9] Yosue T, Brooks SL. The appearance of mental foramina on panoramic and periapical radiographs. II. Experimental evaluation. *Oral Surg Oral Med Oral Pathol.* 1989; 68:488-492. DOI: 10.1016/0030-4220(89)90151-5

- [10] Gershenson A, Nathan H, Luchansky E. Mental foramen and mental nerve. *Acta Anat.*1986;126:21-8. DOI:10.1159/000146181
- [11] Katakami K, Mishima A, Shiozaki K, Shimoda S, Hamada Y, Kobayashi K. Characteristics of Accessory Mental Foramina Observed on Limited Cone-beam Computed Tomography Images. *J Endod.* 2008;34:1441-5. DOI: 10.1016/j.joen.2008.08.033
- [12] Ahmad M, Jenny M, Downie M. Application of cone beam computed tomography in oral and maxillofacial surgery *Australian Dental Journal.* 2012;57:(1 Suppl):82–94. doi: 10.1111/j.1834-7819.2011.01661.x
- [13] SEDENTEXCT Guideline Development Panel. Radiation protection No 172. Cone beam CT for dental and maxillofacial radiology. Evidence based guidelines. Luxembourg: European Commission Directorate-General for Energy; 2012.
- [14] Imada TS, Fernandes LM, Centurion BS, de Oliveira-Santos C, Honório HM, Rubira-Bullen IR. Accessory mental foramina: prevalence, position and diameter assessed by cone-beam computed tomography and digital panoramic radiographs. *Clin Oral Implants Res.* 2012. DOI: 10.1111/clr.12066.
- [15] Oliveira-Santos C, Souza PH, De Azambuja Berti-Couto S, Stinkens L, Moyaert K, Van Assche N, Jacobs R. Characterisation of additional mental foramina through cone beam computed tomography. *J Oral Rehabil.* 2011;38(8):595-600. doi: 10.1111/j.1365-2842.2010.02186.x. Epub 2010 Dec 11.
- [16] Rosa MB, Sotto-Maior BS, Machado V de C, Francischone CE. Retrospective study of the anterior loop of the inferior alveolar nerve and the incisive canal using cone beam computed tomography. *Int J Oral Maxillofac Implants.* 2013;28(2):388-92. doi:10.11607/jomi.2648.
- [17] Yovchev D., E. Deliverska, J. Indjova. Lingual canals in the interforaminal region of the mandible: digital volume tomography observation. *Dental medicine.* 2012; 3,199-203.
- [18] Yovchev D. CBCT in dental imaging diagnostic. *Roentgenologia and radiologia.* 2009; 48: 17-21.
- [19] Yovchev D. Quadruple mental foramina detected by CBCT: a case report, .(2014, Feb 8). {Online}. URL: <http://www.eurorad.org/case.php?id=11444>; doi:10.1594/EURORAD/CASE.11444.
- [20] Yovchev D., Hr. Mihaylova, E. Deliverska, N. Boninska, P. Gagova. Use of cone beam computed tomography in implant dentistry – a review. *Zdrave i Nauka.*2014; 3 (015):16-18.

Author Profile

Associate Professor Dr Hristina Mihaylova PhD, Medical University, Faculty of Dental Medicine-Sofia, Bulgaria, Department of Imaging and Oral Diagnostics. She has experience more than 20 years in the field of diagnostic Imaging. Her main interests are in the area of diseases of maxillo-facial region.